Midwest Engineer

SERVING THE ENGINEERING PROFESSION

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

MARITIME RADIO COMMUNICATIONS—PAGE THREE

Vol. 7 MAY, 1955 No. 12

Though 50% of this block was destroyed, the Roosevelt Hotel (background) with reinforced concrete frame and floors came through undamaged structurally.

Reinforced Concrete Construction Withstands Destructive Waco, Texas Tornado

Above: Two-story building at right with reinforced concrete floors, walls and roof came through the tornado without structural damage but the adjacent structure suffered extensively. Below: This one-story warehouse was built in two sections. The section with reinforced concrete frame, floors and roof was undamaged; the other part was demolished.

The tornado that struck Waco, Tex. on May 11, 1953 killed 115 persons and wrecked property worth millions of dollars. It ripped a path of destruction one mile wide and four miles long.

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Serving the Engineering Profession

MAY, 1955 Vol. 7, No. 12

CONTENTS

COVER STORY

Titanium, one of the hardest-to-get of all metals, is being purified by a unique new method. The process, called cage zone refining, traps the melted titanium inside a bar of the metal itself, thus preventing contamination by any containing crucible. In an inert atmosphere of argon or helium gas inside the bell jar, the titanium bar rises vertically through the heating coil and melts progressively from top to bottom. Impurities such as iron tend to dissolve in the molten metal and be "swept" to the bottom of the bar. Dr. George Comenetz, advisory engineer at the Westinghouse Research Laboratories, checks the temperature of the molten zone of titanium with an optical pyrometer.

—Westinghouse Photo

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On the Great Lakes
And Inland Waterways

Maritime Radio Communications

By K. V. Glentzer, MWSE

Of all the agencies of travel that man has developed the ship is one of the oldest. Communication between vessels and the shore presents a long and romantic story starting with a semaphore system based on the Greek alphabet, and dating as far back as 200 B.C. Communication has always been a necessity in cases of disaster and as an aid to navigation. It could only be accomplished by visual or audible means with a very limited range until the year 1899 A.D. For over 2,000 years communication was practically at a standstill until Marconi in 1899 A.D. was able to communicate by means of radiotelegraphy between a land station and Italian battleships. Immediately radio demonstrated its usefulness in contributing to safety at sea. The incident which focused public attention on the value of radio in saving lives at sea occurred on January 23, 1909. On that date the luxuriously outfitted SS *Republic* collided at sea with the SS *Florida*. Fortunately, the SS *Republic* was one of the 180 ships then equipped for radio communications. The distress message read as follows: "Republic rammed by unknown steamer, twenty-six miles southwest of Nantucket Lightship. Badly in need of immediate assistance, but no danger to life." The *Republic* subsequently sank at sea, but not before aid summoned by radio had provided for the 1,650 passengers of the *Republic* and the *Florida*.

Mr. Glentzer, radio and special services engineer, Illinois Bell Telephone Co., presented this talk before the Western Society of Engineers at its Chicago headquarters on Dec. 14, 1954.

Great Lakes

The Great Lakes comprise one of the greatest shipping lanes in the world. Iron ore from Minnesota is delivered to the steel mills in Indiana, Ohio, Michigan and Pennsylvania. Grain from the central states and the northwest is transported to the eastern seaboard. Coal and finished steel products use the Great Lakes for their transportation. The tonnage of this shipping is so great that two of the leading ports in the United States are located on the lakes; namely, Duluth, Minn. and Chicago, Ill. Duluth is second only to New York City and Chicago ranks sixth. With the progress being made on the St. Lawrence Waterway and the expansion of the Sag channel facilities in Chicago, Chicago is undoubtedly destined to become one of the world's leading ports.

About 475 cargo vessels and 1,000 yachts operating on the Great Lakes are registered by the United States. As an aid to navigation and for distress purposes, many of these vessels are equipped for radiotelephone service. In addition, vessels registered in Canada make frequent use of the radiotelephone service.

Figure 1, Coastal Harbor Stations

Coastal Harbor Service

Coastal harbor service (2-8 megacycle range) are shown in Figure 1. "Coastal Harbor Stations," are operated on the United States shores of the Great Lakes at Duluth, Minn.; Port Washington, Wis.; Rogers City, Mich.; Chicago, Ill.; Detroit, Mich.; Lorain, Ohio; and Buffalo, N. Y. The calling-working method of operation is used on the Great Lakes. By this method the calling-safety channel (2.182 megacycles) may be used in the distress or for initiating calls to be completed on other channels. In addition to the calling and safety channel, four other channels are allocated in the 2 megacycle band and three in the 4-8 megacycle band. These ship to shore channels operate with two frequencies, one for transmitting from the shore station and one for transmitting from the ship station. Each vessel equipped for radio-

telephone service must have the calling and safety channel and the ship to ship channel. This is in addition to any ship to shore channel in accordance with the Rules of the Federal Communications Commission. Ranges extend from a few hundred miles to 1,000 miles or more with various frequencies giving the greatest ranges at various times.

Operation of the public correspondence channels (ship to shore) can be illustrated by the service furnished by Station WAY of the Illinois Bell Telephone Company located near Lake Bluff, Ill. This station is equipped to furnish service on the calling channel, four channels in the 2 megacycle band and three in the 4-8 megacycle range. Since various channels may furnish the best service at various times, the selection of the best available channel is made by the technical operator at the radio station. This operator knows by experience the channels that furnish the best transmission at any time. When a call is established, the operator uses the channel which will give the best transmission at that time. The radiotelephone channels at Station WAY are connected to the regular telephone network through a mobile service switchboard in Chicago.

If a call for a ship originates from a land telephone, it is routed to the traffic operator at the mobile service switchboard. The mobile service operator then calls the technical operator at Station WAY who establishes radio contact with the designated vessel. The vessel may be reached by voice calling on the calling channel, or by use of selective signalling equipment on a working channel. If contact is made on the calling channel, the technical operator immediately transfers the call to the best working channel.

If a call originates from a vessel, it may be on either a working channel or on the calling channel. If on a working channel, the technical operator will decide as to whether this is the best channel, and will complete the call through the mobile switchboard to the land telephone. If on the calling channel, he will ask the vessel to transfer to the best available working channel and will complete the call to the land subscriber through the mobile switchboard.

VHF Maritime Service

VHF (very high frequency) maritime stations operate in the 150-162 megacycle band. Radio signals at these frequencies have characteristics similar to light; namely, the range extends only a moderate distance beyond the horizon. It is, therefore, important that the antennas for the transmitters and receivers be located as high as practical, since the higher antennas give the greater ranges. With reference to Figure 1, VHF land radiotelephone stations are located at Duluth, Minn.; Port Washington, Wis.; Sault Ste. Marie, Mich.; Chicago, Ill.; Detroit, Mich.; Lorain, Ohio; and Geneva, Ohio.

As of recent date, construction permits were issued by the FCC for stations at Hancock, Escanaba, East Tawas, Marquette, Port Huron and Rogers City, Mich.; Green Bay, Wis.; and Martinsville, N. Y.

The stations have ranges limited to 35 miles, or sometimes somewhat more depending on the height of the antennas. Consequently stations separated by com-

(Continued on Page 20)

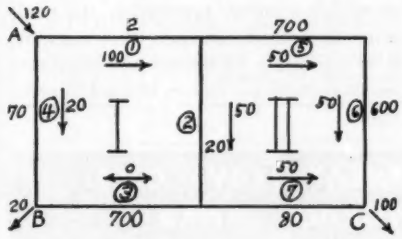
Methods of Determining the

Distribution of Flows in a Network

By K. J. Stanton, MWSE

Part 2

Mr. Hardy Cross, years ago when a professor of Engineering at the University of Illinois, proposed a method of solving network problems.* Knowing the loads in a network and the resistances of the pipe sections, certain calculations are performed successively for each loop in the network until a reasonable approximation of the correct answer has been obtained. The first step in the solution of a network by the Hardy Cross method is to choose the flow both as to quantity and direction in each pipe section. No experience or



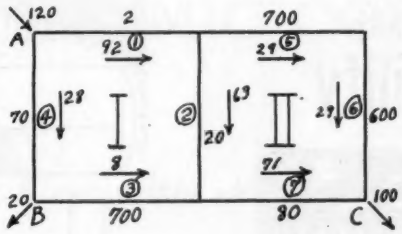
	LOOP I	LOOP II
ΣQR		
	200	35000
	1000	30000
	0	4000
	1400	1000
	2600	70000
ΣQ^2R		
	−20000	−1750000
	−50000	−1500000
	0	+ 200000
	+28000	+ 50000
	−42000	−3000000

$$\Delta = \frac{-42000}{2(2600)} = -8 \qquad \frac{-3000000}{2(70000)} = -21$$

Figure 12

judgment is needed in this, but the closer the assumed quantities are to the correct quantities, the quicker the problem will be solved. Thus, the judgment of an engineer will tend to reduce the time involved in solving the problem.

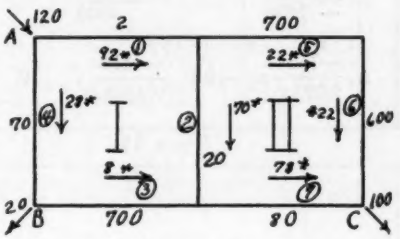
Figure 3, the network we studied before, is reproduced as figure 12. For each pipe section, several calculations will be made in each step of the solution. First, we obtain the product of the flow and the resistance (QR), and this product is without sign. Next, we obtain the product of the flow to the X power and the resistance (Q^XR). These Q^XR products shall have a sign, and the sign is determined thus—if the flow is in a clockwise direction, the sign shall be negative; if it is counterclockwise, it shall be positive. This determination of the sign is a convention only, and other conventions might be used. The correction factor (Δ) to be applied to the various flows in the pipe sections of the loop to bring the solution more closely to the correct one is obtained by the formula $\Delta = \frac{EQ^XR}{2EQR}$ The correction factor, with sign, is then subtracted from the various flows, the flows having the sign determined by the convention just mentioned. The direction of the revised flow is indicated by the sign. In the case of pipe sections common to two loops, the correction factor for both loops must be applied to the flow in such section. For example, in figure 12, in the case of pipe section 2, both the correction factor for Loop I and the correction factor for Loop II must be applied to the flow in pipe section 2. It will be noted that



	LOOP I	LOOP II
ΣQR		
	184	20300
	1260	17400
	5600	5680
	1960	1260
	9004	44640
ΣQ^2R		
	−16928	−588700
	−79380	−504600
	+44800	+403280
	+54880	+ 79380
	+3372	−610640

$$\Delta \quad \frac{+3372}{2(9004)} = +0.2 \qquad \frac{-610640}{2(44640)} = -7.2$$

Figure 13



	LOOP I	LOOP II
ΣQR		
	184	15400
	1400	13200
	5600	6240
	1960	1400
	9144	36240
ΣQ^2R		
	−16928	−338800
	−98000	−290400
	+44800	+486720
	+54880	+ 98000
	−15248	− 44480

$$\Delta \quad \frac{-15248}{2(9144)} = -0.8 \qquad \frac{-44480}{2(36240)} = -0.6$$

*Nearest whole number was in correcting these flows, i.e., zero for Loop I and 7 for Loop II.

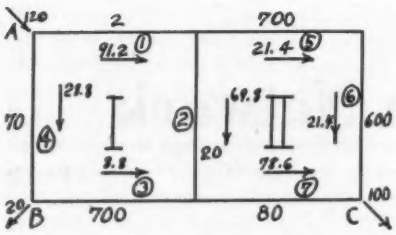
Figure 14

with reference to Loop I the flow in pipe section 2 is negative, while with reference to Loop II, it is positive.

Figure 12 shows these calculations, and figures 13, 14, 15, and 16 show how the correct solution is obtained.

*Bulletin No. 286, University of Illinois Engineering Experiment Station—"Analysis of Flow in Network of Conduits or Conductors" by Hardy Cross.

Mr. Stanton, who prepared this paper, is an assistant gas engineer with the Northern Illinois Gas Company.



	LOOP I	LOOP II
ΣQR		
	182	14980
	1396	12840
	6160	6288
	2016	1396
	9754	35504
ΣQ^2R		
	−16634	−320572
	−97440	−274776
	+54208	+494237
	+58030	+ 96603
	− 1836	− 4508

$$\Delta \frac{-1836}{2(9754)} = -0.1 \qquad \frac{-4508}{2(35504)} = -0.1$$

Figure 15

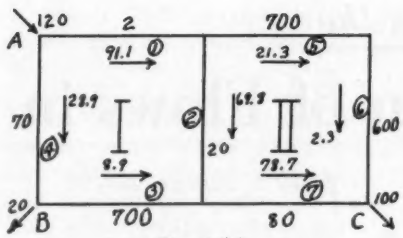


Figure 16

As has just been demonstrated, the solution of a network by the Hardy Cross method is a series of repetitive calculations involving addition, subtraction, multiplication, and division. A digital computer is a machine which will very rapidly perform such computations together with a memory system in which instructions or information can be stored. Thus, it lends itself to mechanizing the solution of the network. All that is necessary is that we instruct the computer to make the calculations that we desire. How we do this will shortly be presented, but first we must describe some of the characteristics of the machine for which we shall write the program. While there are many types of computers and probably any of them can be adapted to solving these network problems, the program that I shall present later will be for a card-programed calculator, that is one in which the information and instructions to the machine are supplied by means of punched cards.

On the card shown in figure 17, certain columns are labeled. The first eight columns are used to number the cards. The A-address is the address in the memory from which the number to be operated upon is taken. The numbers punched in the four columns headed "Operation" determine the kind of arithmetical process to be used. The B-address is the address in the memory from which the other number in the operation is to be taken. The C-address is the address in the memory in which the result of the operation is to be stored. The A and B fields are means by which numbers punched in the cards may be introduced into the machine. The various arithmetical operations to be performed are shown in the following code:

Operation Code

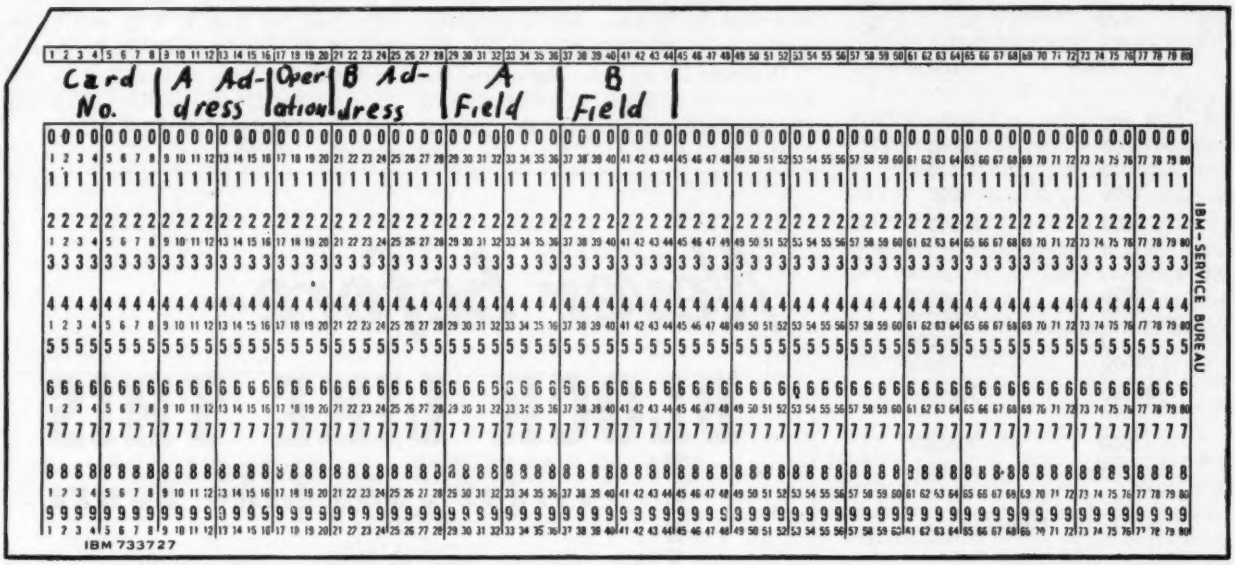
01	A+B
11	−A+B
02	A x B
12	−A x B
22	A÷B

The address in the memory will be identified by decimal numbers starting with 11. If the address is followed by .0, it means that the stored number shall include the sign. If the address is followed by .1, it means that the number will be stored without sign.

Certain other details of the computer we have in mind are as follows:

1. Computer will handle the decimal properly including storing it.

Figure 17, Below



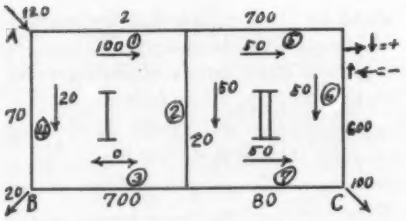


Figure 18

2. Computer will handle plus and minus signs properly including storing them with the numbers if so instructed.

3. Memory unit will release the information about a number from storage without erasing the number.

4. Sending a number into storage at any memory address will erase information previously stored at that address.

In figure 18, we have reproduced the information in figure 12 which showed the initial calculation by the manual Hardy Cross method. Before we present the program, there are several conventions to be used which are different than previously used. Flows to the right and down are considered positive. Flows to the left and up are considered negative. The pipe sections on the top and right of a loop, such as 1, 5, 2, and 6, are class I. The pipe sections on the bottom and left of a loop, such as 3, 7, 4, and 2, are class II pipe sections. You will

(Continued on Page 16)

Board of WSE Increases Dues

Your Society has had difficulty for the past three years trying to make ends meet. As a result it has had to draw on surplus funds accumulated many years ago to pay the deficits. It is obvious that we cannot continue to operate on this basis and that definite steps must be taken to eliminate the annual deficit.

Your Board has been aware of this problem for some time. It delayed increasing the dues hoping it would be possible to break even by:

1. Increasing income through
   (a) Increased advertising
   (b) A considerably increased membership, and
   (c) A greater membership participation in headquarters activities, and
2. Reducing expenses.

These hopes have only been partially realized.

The facilities provided at our headquarters are not only adequate but compare favorably with any in the country except for those few that have been heavily endowed. While the members have contributed generously toward these facilities, the greater portion of the cost was borne by local industry. Our membership dues are not only outdated but fail to meet the expense of maintaining these facilities.

Your Board asked the Finance Committee to make a continuing review of the Society's financial position and make whatever recommendations it deemed necessary. The Finance Committee recommended and the membership of the Society voted overwhelmingly for the amendment placing the dues under the direct control of the Board. After a thorough study of the Finance Committee's report, your Board adopted a new schedule of dues as shown above:

Grade of Membership	Annual Dues	
	Res.	Non-Res.
Member	$28.50	$20.00
Associate (First 7 yrs. in grade)	15.00	10.00
Associate (Transfer from student member)	15.00	10.00
Associate (After 7 yrs. in grade)	28.50	20.00
Affiliate	25.00	15.00

No increase will be made in the dues of Student Members.

Thoughts . . .

Sin is not hurtful because it is forbidden, but it is forbidden because it is hurtful.

* * *

Great Merit is coy, as well as great pride.

* * *

A Slip of the Foot you may soon recover, but a slip of the Tongue you may never get over.

—Poor Richard's Almanack

Nonexistent Knowledge—Our Hope

America's industrial progress depends to a great extent on the procurement of knowledge that does not now exist, according to Dr. Daniel Alpert, of Pittsburgh, Pa. manager of the physics department of the Westinghouse Research Laboratories. He reported that a large portion of Westinghouse research activities is aimed at obtaining information that has nothing to do with the development of a special product or the commercial application of a process.

Speaking before the Providence, R. I., Engineering Society on April 20, Dr. Alpert said that it takes about ten years for an industry or the public to derive benefit "from the acquisition of a new piece of fundamental knowledge."

In outlining the three forms of research as regarded by Westinghouse—namely fundamental, basic and applied—the speaker declared:

"In the simplest terms, the emphasis in our fundamental research activity, which represents about 30 percent of our total research effort, is placed on securing knowledge that does not now exist—knowledge about nature itself. This form of research is beamed at the development of no special product and does not contemplate any immediate commercial application."

Describing the basic phase of research operations, Dr. Alpert said it accounts for about 60 percent of his company's total research activity.

"This, too," he explained," is devoted to the development of knowledge that does not now exist, but in this field—basic research—we know what we want before we start; we are working to satisfy a known need for improvement, and we know already how we will benefit if we can get the proper research answer."

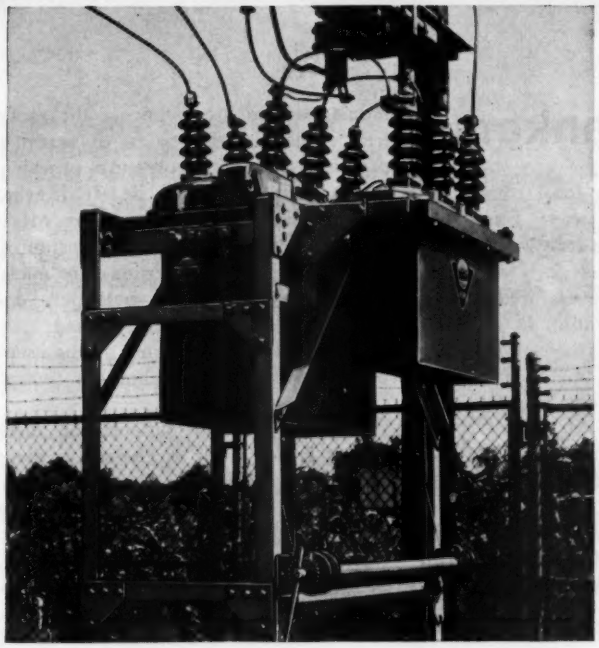
Applied research, he said, is tied in with engineering development and is concerned with testing of suppliers' materials, studying new equipment and testing new designs.

Citing as an example of how research scientists today are "shooting in the dark," Dr. Alpert pointed out that in 1937 Westinghouse erected at its Research Laboratories in East Pittsburgh, Pa., the first industry-built atom smasher.

The fundamental reason for starting that project was to add to our field of knowledge in nuclear physics. No mention was made in 1937 and no thought was given then toward carrying our experiments to the point of securing useful energy from the nucleus. But, the practical results of that undertaking have been tremendous for it served as the groundwork for Westinghouse to build the world's first atomic engine for a submarine, the *U. S. S. Nautilus,* which began its sea trials last January. And of course these early studies were invaluable in the design of the nuclear reactor portion of the nation's first full-scale power plant at Shippingport, Pa. Westinghouse is constructing the reactor of the plant for the Atomic Energy Commission while the Duquesne Light Company is building the electric generating portion.

Indicative of the continuing need for a vast research program, the Westinghouse scientist said, is the multi-million dollar investment his company is making in a new, ultra-modern research center now nearing completion on the outskirts of Pittsburgh.

"In these new laboratories," he said, "we will be able to continue probing into the unknown and perhaps our results will be even more spectacular than the nuclear research operation. By no means are we approaching the peak of the curve of technical progress."



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Gunlock Speaks Before Bankers

More and more municipalities, public officials and civic leaders throughout the nation are realizing that local transit is absolutely indispensable to urban living, V. E. Gunlock, (MWSE), chairman of the Chicago Transit Board, recently told the Nineteenth Annual Conference of the Central States Group, Investment Bankers of America, in the Drake Hotel in Chicago.

Coupled with this trend, Gunlock said, is a growing tendency and willingness of public agencies and public officials to help local transit remain strong and vigorous. This aid, he said, is evidenced in many ways—by relief from franchise charges, elimination of gross receipt and other taxes, lifting of requirements for street paving and snow removal, and easing of restrictive and oppressive regulation.

In these two trends, which are moving forward together, lies the hope for a brighter future for local transit in the nation's larger urban communities, Gunlock said. This development, he added, is of post World War II origin, and is a natural outcome of the intense efforts that cities everywhere are making to solve the complex traffic problems resulting from the skyrocketing increase in ownership and use of private automobiles.

"Some years ago local transit was merely tolerated," Gunlock said. "It was condemned and criticized on every hand —perhaps with some justification. It was the whipping post of politicians. It was a 'fair' target for restrictive regulation. Municipalities tapped local transit tills for money to help pay municipal operating expenses. Transit could—and did —endure this treatment because it was a monopoly, and a money-making one.

"But time — and progress — have changed transit's status," Gunlock continued. "Today it is no longer a monopoly. It hasn't even the slightest resemblance to one, although, technically and actually, it is still a public service.

"This dramatic change in the character of the industry," Gunlock continued, "was brought about by the private automobile. Today local transit, particularly surface local transit, is in the throes of an intensely competitive struggle with the private automobile.

"This automobile competition," Gunlock said, "is hitting local transit terrifically hard in two ways. First, it is taking customers from transit, especially surface transit. Second, it is depriving transit of street space essential to fast, regular, on-time operation of its buses and streetcars. Traffic congestion created by the private automobile and truck has slowed surface transit in rush hours to a horse-and-buggy pace.

"The private automobile has also stepped up the rate of decentralization," Gunlock continued. "Our larger urban communities are exploding at their peripheries. Not only are families leaving the central city for homes in the suburbs; industries also are following the same trail. This situation adds to transit's problems—and to the pressures to which it is normally subjected. Rarely, if ever, do developing outlying areas offer enough traffic potential for extension of transit services. If extensions are made before adequate traffic potentials develop, the operations are carried at a loss that must be supported by the users of profitable routes within the central city.

"Fortunately the outlook for local transit is not at all as gloomy as these facts about automobile competition may indicate," Gunlock continued. "The changed attitude toward transit is bringing constructive and corrective action.

The tendency to treat the private auto-

mobile as the glamour child of our amazing, unequalled economic progress is steadily diminishing," Gunlock said. "We're becoming realistic about the private automobile. We know now, from our vigorous efforts to solve urban transportation problems, that the private automobile is not the solution. We know that it is, at the normal rate of occupancy—1.5 passengers per automobile—a most inefficient user of street space. We know, too, that it is futile—as well as foolhardy—to expect the private automobile to do local transit's job.

"Take Chicago, for example. Here there are more than 1,000,000 people who rely upon local transit every weekday to take them to and from work, to and from shopping, to and from school, to and from recreational centers. To transport these people by automobile would require about 665,000 automobiles—at the present average rate of occupancy.

"This would mean superimposing another 665,000 automobiles upon the 500,000 or so automobiles now using our streets every day. Can you visualize the resulting chaos? One million one hundred and sixty-five thousand automobiles jammed into our streets! They'd be traffic-jammed from one end to the other—and the economic life of the city would be completely paralyzed.

"This little illustration emphasizes the cardinal fact in the situation—the all-important fact that governmental agencies, public officials and civic leaders are now realizing—that public agencies would bankrupt themselves in trying to widen streets, build super-highways, parking garages and lots, and to provide traffic control facilities to enable the private automobile to do the job that only local transit can do.

"Consequently local transit is now being widely regarded as the solution of our urban traffic problems. It is the most efficient, the most economical user of street space. One bus with a seated load carries 33 times as many passengers as a private automobile. It occupies less than one-twelfth the street space that would be used by automobiles—loaded at the prevailing average capacity—would require. A bus or streetcar, furthermore, is constantly moving in traffic—not stored in the traffic lanes creating bottlenecks.

"All transit needs—all it wants, in fact—is a 'fair shake'; and that is less favoritism for the private automobile; more consideration for local transit. This does not mean harshly severe restrictions on the private automobile. The motorist, after all, has rights, too, that must be respected and preserved, but it does mean that ways must be found to enable transit to use to fullest advantage the speed potentials of modern transit vehicles, as well as the inherent efficiencies of transit vehicles in carrying people and in using street space.

"Speed is absolutely essential to the attractiveness and convenience of local transit service. Transit now has a tremendous competitive advantage over the private automobile in cost to the user, but the years since World War II have proved that this cost advantage, without speed, is meaningless.

"There are two ways that the speed of transit service can be increased, and both are necessary in our larger urban communities to enable transit to compete with the private automobile on a more equal footing.

"First, the speed of surface operations can be enhanced spectacularly by clearing our streets of traffic congestion; and second, speed can be attained by extending transit routes in off-the-street, grade-separated rights-of-way, above or below ground. The two methods complement one another.

"What this means, essentially, is estab-

lishing and maintaining a proper balance between traffic ways and transit ways. Here in Chicago we are seeking to achieve this objective.

"First, we are vigorously attacking our street traffic problems to speed up the flow of traffic, including, of course, local transit traffic. Six publicly owned parking garages have been opened recently in the central business district, others have been established in outlying areas, and more are to be opened.

"Second, and concurrently, we are bringing our transit ways and our traffic ways into balance. The initial step toward this objective was the construction of the two subways now being operated by CTA. These facilities were built by the City and the Federal government at a cost of $75,000,000.

"Now the City is providing $25,000,000 for construction of a 10-½ mile extension of the Milwaukee Avenue-Dearborn Street subway in the median strip of the Congress Street Expressway. The City is also co-operating with other public agencies—the county, the state and the Federal government—in constructing and financing the cost of the Congress Expressway.

"Another Expressway—the Northwest is under construction—and here, too, the City in co-operation with the County, the State and the Federal government, is adhering to the program of balanced transit ways and traffic ways by taking steps to provide rapid right-of-way in the median strip between the traffic lanes.

"Here, then, are specific existing local precedents to enable transit to compete with the private automobile: First, the balancing of transit ways and traffic ways; second, the use of public funds to construct and combine transit facilities with the traffic facilities of expressways.

"Inherent in these precedents is acceptance of the proposition that we have long advocated—that local transit is actually an indispensable public service, just as are public health, police, fire, water, and sanitation services. This means consequently that the heavy cost of off-the-street, grade-separated extensions of local transit should not be borne by local transit users, since transit is a public service, but should be financed from public funds by public agencies," Gunlock concluded.

Eshbach Award Recipient Named

Norman E. Bartelt, of 1621 N. Newcastle, Chicago, has been named as recipient of the 1955 Eshbach award at the Northwestern University technological institute.

The award is presented annually to the outstanding senior in the institute's graduating class. Bartelt is a student in the industrial engineering curriculum.

Awarded honorary mention was Robert K. Chen, a senior in electrical engineering, of 844 Custer, Evanston.

The Eshbach award, inaugurated in 1945, is named in honor of Ovid W. Eshbach, MWSE, Walter P. Murphy professor of engineering sciences at the technological institute.

Two Motors Can Whip Up Storm

Man-made hurricanes, with velocities up to 3800 miles an hour, were a step nearer reality recently as the world's two most powerful motors were given their official "start-up" in Tullahoma, Tenn., by engineers of Westinghouse Electric Corporation and the U. S. Air Force's Arnold Engineering Development Center.

Built in East Pittsburgh, Pa. for use in the Air Force's new transonic and supersonic propulsion wind tunnels, the two giant 83,000 horsepower motors were set into motion at the rate of 600 revolutions per minute by two "starting" motors each having a 25,000 horsepower rating. The combined rating of all four motors, when the installation is completed, will be 216,000 horsepower.

The entire rotating machine, including the two 83,000 horsepower units and two "small" motors connected in tandem fashion to five even larger compressors, will be almost as long as two football fields. The compressors were not yet ready to be placed in operation.

At the official start-up test, as Westinghouse and Air Force officials stood by, an engineer first pressed the starter switch on the 25,000 horsepower motor which brought the record-breaking 83,000 horsepower unit into action until its giant rotor was turning at 600 rpm. At this point the machine was synchronized with the electric power system and the drive unit was officially started.

A single shaft through this machine will be capable of driving the world's largest rotating wind-producing device for testing and evaluating supersonic planes, aircraft engines and guided missiles in the two wind tunnels.

The Arnold Engineering Development Center is a part of the Air Research and Development Command which is responsible for the overall Air Force research and development program.

When the wind tunnels are in full operation, man-made gales will race around two separate closed courses inside a huge pipe that is nearly wide enough to hold both tubes of New York's Holland Tunnel.

Each of the 83,000 horsepower motors weighs 225 tons, as much as a railroad locomotive. The four motors together will use enough electric power to supply the entire city of Nashville, Tenn. The wind tunnels will require 100,000 gallons of cooling water per minute, a consumption rate equal to that of a city about the size of Washington, D.C.

The installation of the transonic compressor will be completed about the middle of this year. The four supersonic machines will be installed later.

Westinghouse engineers pointed out that despite the tremendous weight and speed of the motor and compressor system, it can be brought to a halt in about three minutes by using the wound-rotor motors as brakes. In this fashion, energy is dumped into liquid rheostats—the world's largest—which are used for secondary control.

Distribution of Flows

(Continued from Page 8)

notice that pipe section 2 is Class I with respect to Loop I, but Class II with respect to Loop II. The class of pipe section is used in two ways. First, when taking the Q to multiply it by the QR to obtain the product Q^2R, if the flow is in a class I pipe section, the sign remains the same. If it is in a class II pipe section, the sign is reversed. Second, the correction factor (Δ)is subtracted from the previous flow in the case of class I pipe sections, while it is added in the case of class II pipe sections.

The program for the computer we have described which will enable it to solve the network shown in figure 18 is presented in figure 19. The cards would be punched out as shown in this program, and when these cards are fed into the computer, it would solve the network. There is nothing mysterious about programming a digital computer to solve a network problem. All that is necessary is a knowledge of the computing machine and some tedious, exacting work. But once having established the program for any network, it may be used for future problems with only slight modification. Also, it serves as a pattern for other networks which makes the writing of succeeding programs much easier. Any experienced programmer could produce a more efficient program than the one illustrated here. The author was associated with the solution of a network consisting of about 195 loops, 725 pipe sections, 350 loads, and 13 sources, using a large capacity digital computer. After conversion of the data from decimal to binary numbers, the solution was obtained in 24 minutes.

Another way in which the network may be solved is by an analog computer. Such a computer is one in which the various elements of a problem are simulated by some other means. That is, a model of the problem is constructed, and from it the desired solutions are obtained. The model may have no physical resemblance to the problem or the structures involved in the problem. The most common analog computers are those in which electrical elements represent the various components. Such analogs are widely used for solving many different problems, such as stresses and strains in mechanical devices, trajec-

LOOP I								LOOP II							
Card No.	A Address	Operation	B Address	C Address	A Field	B Field	REMARKS	Card No.	A Address	Operation	B Address	C Address	A Field	B Field
01		01		11.1	2.0	0.0	Add R_1 [R_5]* in A-Field to Zero in B-Field and Store w/o Sign	101		01		111.1	700.0	0.0
02		01		12.1	20.0	0.0	Ditto R_2 [R_6]	102		01		112.1	600.0	0.0
03		01		13.1	700.0	0.0	Ditto R_3 [R_7]	103		01		113.1	80.0	0.0
04		01		14.1	70.0	0.0	Ditto R_4 [R_8]	104		01		114.1	20.0	0.0
05		01		21.0	+100.0	0.0	Add Q_1 [Q_5] in A-Field to Zero in B-Field and Store w/ Sign	105		01		121.0	+50.0	0.0
06		01		22.0	+50.0		Ditto Q_2[Q_6]	106		01		122.0	+50.0	0.0
07		01		23.0	0.0	0.0	Ditto Q_3 [Q_7]	107		01		123.0	+50.0	0.0
08		01		24.0	+20.0	0.0	Ditto Q_4 [Q_8]	108		01		124.0	+20.0	0.0
09	11	02	21	31.1			Multiply Number in 11 (R_1) [111 (R_5)] by Number in 21 (Q_1) [121 (Q_5)] and Store w/o Sign	109	111	02	121	131.0		
10	12	02	22	32.1			Ditto R_2 Q_2 [R_6 Q_6]	110	112	02	122	132.0		
11	13	02	23	33.1			Ditto R_3 Q_3 [R_7 Q_7]	111	113	02	123	133.1		
12	14	02	24	34.1			Ditto R_4 Q_4 [R_8 Q_8]	112	114	02	124	134.1		
13	31	01	32	41.1			Add Number in 31 (R_1 Q_1) [131 (R_5 Q_5)] to Number in 32 (R_2 Q_2) [132 (R_6 Q_6)] and Store w/o Sign	113	131	01	132	141.1		
14	33	01	34	42.1			Ditto 33 (R_3 Q_3) [133 (R_7 Q_7)] and 34 (R_4 Q_4) [134 (R_8 Q_8)]	114	133	01	134	142.1		
15	41	01	42	43.1			Ditto 41 [141] and 42 [142] to give ΣRQ in 43 [143]	115	141	01	142	143.1		
16	21	02	31	51.0			Multiply Number 21 (Q_1) [121 (Q_5)] by Number in 31 (R_1 Q_1) [131 (R_5 Q_5)] and Store w/ Sign	116	121	02	131	151.0		
17	22	02	32	52.0			Ditto 22 (Q_2) [122 (Q_6)] and 32 (R_2 Q_2) [132 (R_6 Q_6)]	117	122	02	132	152.0		
18	23	12	33	53.0			Change Sign of Number in 23 (Q_3) [123 (Q_7)] Multiply by Number in 33 (R_3 Q_3) [133 (R_7 Q_7)] and Store w/ Sign	118	123	12	133	153.0		
19	24	12	34	54.0			Ditto 24 (Q_4) [124 (Q_8)] and 34 (R_4 Q_4) [134 (R_8 Q_8)]	119	124	12	134	154.0		
20	51	01	52	61.0			Add Number in 51 (R_1 Q_1^2) [151 (R_5 Q_5^2)] to Number 52 (R_2 Q_2^2) [152 (R_6 Q_6^2)] and Store w/ Sign	120	151	01	152	161.0		
21	53	01	54	62.0			Ditto 53 (R_3 Q_3^2) [153 (R_7 Q_7^2)] and 54 (R_4 Q_4^2) [154 (R_8 Q_8^2)]	121	153	01	154	162.0		
22	61	01	62	63.0			Ditto 61 [161] and 62 [162] to give ΣRQ^2 in 63 [163]	122	161	01	162	163.0		
23	43	02		71.0	2.0		Multiply Number in 43 (RQ) [143] by Number in A-Field and Store w/ Sign	123	143	02		171.0	2.0	
24	63	22	71	72.0			Divide Number in 63 [(ΣRQ^2) 163] by Number in 71 (ERQ) [171] and w/ Sign	124	163	22	171	172.0		
25	72	11	21	21.0			Subtract Number in 72 (Δ) [172] from Number in 21 (Q_1) [121 (Q_5)] and Store w/ Sign	125	172	11	121	121.0		
26	72	11	22	22.0			Ditto 22 (Q_2) [122 (Q_6)]	126	172	11	122	122.0		
27	72	01	23	23.0			Add Number in 72 (Δ) [172] to Number in 23 (Q_3) [123 (Q_7)] and Store w/ Sign	127	172	01	123	123.0		
28	72	01	24	24.0			Ditto 24 (Q_4) [124 (Q_8)]	128	172	01	124	124.0		

SKIP CARDS ENDING IN 01 TO 08 INCLUSIVE AND REPEAT AS MANY TIMES AS NECESSARY TO OBTAIN DESIRED ACCURACY

Figure 19

REFINEMENT OF BALANCE

Branch	$C_L L_F$	R_1	I_1	R_2	I_2	I_{m1}	R_3	I_3	I_{m2}	R_4	I_4
B-C	566×10^{-11}	0.566	0.155	0.876	0.120	0.137	0.775	0.140	0.138	0.780	0.139
C-D	566×10^{-11}	0.566	0.041	0.237	0.076	0.058	0.328	0.057	0.057	0.325	0.059
B-G	136×10^{-11}	0.136	0.103	0.141	0.072	0.087	0.119	0.091	0.089	0.122	0.090
G-E	566×10^{-11}	0.566	0.069	0.390	0.073	0.071	0.402	0.070	0.070	0.399	0.072
E-D	283×10^{-11}	0.283	0.141	0.399	0.175	0.158	0.447	0.156	0.157	0.445	0.158
A-G	136×10^{-11}	0.136	0.175	0.239	0.142	0.158	0.216	0.160	0.159	0.217	0.160
A-E	849×10^{-11}	0.849	0.073	0.619	0.101	0.087	0.739	0.088	0.087	0.743	0.087

Figure 22

tories of projectiles, and so forth.

The common AC or DC network calculator is an analog computer where the various elements of the electrical transmission or distribution systems are represented by suitable electrical elements. The calculation of the flows in an electrical network with direct current electricity is a straightforward matter, and for many years electrical engineers have used such calculators to solve such problems.

However, when the pressure drop is not in direct relationship to the flow, but rather is in some relationship such as a power greater than 1, the solution is not straightforward. Thus in the case of water or gas where the pressure flow relationship is expressed by the formula $H = KQ^x$ where x is greater than 1, expedients must be used.

The first work along this line with which the author is familiar was conducted at the Illinois Institute of Technology by J. P. Clennon and J. K. Dawson. They were interested in solving gas networks and devised a method by which the solution could be obtained with the use of a DC network calculator. Their method involves a series of adjustments made by a prescribed routine which results in an answer accurate enough for engineering purposes. An example of a problem solved by the Clennon-Dawson method is shown below, being taken from their paper "Gas Distribution Problems Solved by Electric Network Calculators," presented before the American Gas Association in April 1951.

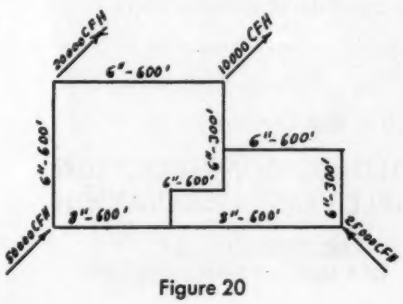

Figure 20

Figure 20 illustrates the gas system under study.

Figure 21 shows the schematic electrical setup. Proper conversion factors must be used between voltage and gas pressure and between current flow and gas flow together with proper sizing of resistances so that the data may be brought within the range of the equipment being used. The factor $C_L L_F$ takes into account the length and size of each pipe section, the gas flow formula being used, and the units being used, etc., so that when it is multiplied by Q^2, it will truly give the pressure drop. It is common to make the initial value of the resistance which represents a pipe section proportional to the $C_L L_F$ factor.

Having determined the conversion factors, the values of the resistances, and input and output currents, the network analyzer is set up; that is, appropriate connections are made so that the elements in the calculator will be connected as schematically shown in Figure 21.

Having set up the board as indicated above, the current flows are read and recorded as I_1. The resistance units are

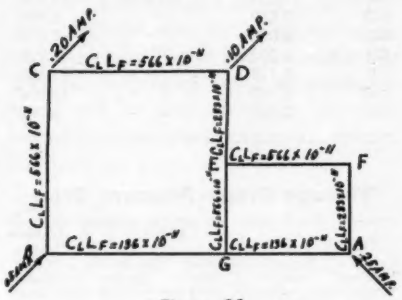

Figure 21

now readjusted in proportion to the product of the current flow and the factor $C_L L_F$ and recorded as R_2. Current inputs are readjusted and the currents in each branch read and recorded as I_2. I_{m1} is then calculated being the mean

value of I_1 and I_2. Again the resistances are adjusted in proportion to the product of Im_1 and the factor $C_L L_F$ and recorded as R_2. This process is repeated until satisfactory accuracy is obtained which will be indicated when the recorded value of I is close to the Imn value just calculated.

Conversion of Measured Values To Actual Values

Current Flow — Gas Flow

Branch	Current Flow	Conversion Factor	Gas Flow CFH
B-C	0.139	1.0×10^5	13,900
C-D	0.059	"	5,900
B-G	0.090	"	9,000
G-E	0.072	"	7,200
E-D	0.158	"	15,800
A-G	0.160	"	16,000
A-E	0.087	"	8,700

Voltage Drop — Pressure Drop

Location	Potential	Potential Change	Conversion Factor	Pressure Inches Water Column
C	0.848			4.00
A	1.000	0.152	1.0 x 10	5.52
B	0.956	0.108	"	5.08
C				
D	0.867	0.019	"	4.19
E	0.938	0.09	"	4.90
G	0.966	0.118	"	5.11

Figure 23

The observed current flows are then converted to gas flows and voltage drops converted to pressure drops.

Other work has been done in this field along similar lines, but with a view to simplifying the calculations or adjustments required.

Professor McIlroy of Cornell University has done considerable work on analog devices for flows in fluid networks. He recently has developed a vacuum tube element called "Fluistor," in which the voltage drop across the tube is proportional to a power of the current flowing.* It is possible to have this power of various values, but a common power is 1.85. This power is commonly used in calculating head losses in water systems and is close enough to the power 2 commonly used in gas flows so that it may be used for that purpose. With such a Fluistor, the gas or water system may be directly represented by the analog computer and results obtained directly without a series of corrections.

Summing up, the method used in determining the distribution of flows in a network will depend upon the circumstances prevailing in different situations. If only a small network is to be solved occasionally, probably the manual method or the Hardy Cross method would be the most suitable. If, on the other hand, a large number of large networks must be solved frequently, probably the solution would best be by analog or digital computer. Other factors, such as the size of the organization, the number of engineers, and facilities available, will also influence the choice of method.

*American Gas Association Monthly, September, 1953, page 19.

CRERAR LIBRARY
News and Notes

The John Crerar Library, in cooperation with the Office of Naval Research, will exhibit May 9th through June 17th representative examples of basic and applied research in recent and current engineering and medical projects sponsored by the ONR. The exhibit of models, photographs, and diagrams, will be housed principally on the fourth, ninth, twelfth and fourteenth floors of the Crerar building at Randolph and Michigan. The Library is open Mondays through Saturdays from 9:30 a.m. to

5:30 p.m. and until 9 o'clock Monday evenings.

Syncro-Cyclotron material from the ONR project at the University of Chicago will be exhibited in the Crerar's Technology Department on the 14th floor. Other exhibits include The Liebhart project on diffraction, working models of air and water demontrators and the chain-reacting Pike demonstrator, and the Skyhook project. ONR-sponsored research in chemistry will be housed on the fourth floor, where the Chicago section of the American Chemical Society has offices. Examples of current medical and dental research sponsored by the ONR will be shown in the Crerar's medical library on the 12th floor. Other exhibits will be placed in the ground floor lobby and ninth floor.

The Office of Naval Research staff was originally located in the Crerar building in order to have ready access to the resources and facilities of the library. Members of the Crerar staff will be on hand to explain the use of the library's extensive card indexes and other reference facilities to the million-plus books, pamphlets and journals on scientific and technological subjects from the major centers of Europe, Russia and the Far East as well as North and South America and Great Britain.

"Finder's List" for Engineers Started

Engineers Joint Council has announced that it is assembling a "Finder's List" of key members of the profession throughout the nation who would assist in locating engineering talent needed in time of national emergency. The work is being done in cooperation with the National Science Foundation, of Washington, D. C., which Congress directed to establish the National Register of Scientific and Technical Personnel. Engineers Joint Council has undertaken to maintain the engineering phase on a current basis.

Some 8,000 of an expected 20,000 leaders in all branches of engineering have already been listed. These will be men of recognized standing whose experience or present positions enable them to know where engineering help may be found. Through these, in time of emergency requiring immediate location of experts in particular fields involved by the emergency, the Government will be able to contact those needed.

Engineers Joint Council, with headquarters at 29 West 39th Street, New York City, is a federation of ten major national organizations with a total membership of 196,000. However, the rest of the approximately 500,000 engineers of the nation are equally represented in the "Finder's List."

Several major scientific organizations have undertaken the registration of scientists, with an expected total approaching 200,000. This section of the Register will not be limited to a "Finder's List" but has as its objective the inclusion of all qualified scientists. The records, both as to engineers and scientists, will be maintained by the individual organizations with copies in the hands of the Foundation.

On Praise

If you would reap Praise you must sow the Seeds, gentle Words and useful Deeds. —Poor Richard's Almanack

Maritime Radio

(Continued from Page 4)

paratively short distances will not interfere with each other. This arrangement permits all such stations to handle calls at the same time, and accordingly the message handling capacity is multiplied by the number of stations in operation.

In accordance with the Rules of the Federal Communications Commission, it is mandatory that each vessel equipped with radiotelephone service be able to operate on a minimum of three channels; (1) Calling and Safety Channel (156.8 megacycles), (2) Ship to Ship Channel (156.3 megacycles) and on at least one ship to shore channel. The two channels assigned to public correspondence operate through the VHF maritime station in Chicago. The land station for one channel transmits on 161.9 megacycles and receives on 157.4 megacycles, and the other transmits on 161.9 megacycles and receives on 157.4 megacycles. Seven other channels operating on a single frequency basis are available for other purposes such as port operations, ship to shore not connecting to the telephone network, ship to ship, etc.

The calling-working method may be used on these channels or if desired, the vessels may be signalled on the public correspondence channels by selective ringers. To meet the requirements established by the Federal Communications Commission, multi-channel mobile sets operating on at least three channels may be installed or two or more mobile sets each operating on one or more frequencies may be used for the required three frequencies.

Inland Waterways

The Illinois River and the Sag Channel near Chicago connect with the Mississippi River System. This system can handle the larger vessels operating from New Orleans to Pittsburgh, Chicago, Minneapolis, and Knoxville, Tenn. Almost 7,000 barges, with a capacity of over six and one quarter million tons, and about 1,500 tow boats with approximately three quarters of a million horsepower operate on the Mississippi River System.

The volume of traffic has increased over 600% since 1931, and many industries are taking advantage of the cheaper freight rates afforded by water transportation. With this increase in traffic, efforts are being made by the operators of these vessels to handle greater loads and to eliminate delays. Consequently vessel operators are finding radio communication more and more important.

Coastal Harbor Service

Radiotelephone service was first established at Memphis, Tennessee in 1938. Additional stations have been located at Chicago, Pittsburgh, St. Louis, and Louisville.

Chicago Station WAY of the Illinois Bell Telephone Company is located near Lake Bluff, Ill., and is the same station that furnishes Coastal Harbor service on the Great Lakes.

The same calling frequency (2.182 megacycles) is used on the rivers as well as on the Great Lakes. In addition, there is one ship-ship channel, one working channel in the 2 megacycle band, and 5 channels in the 4-8 megacycle range. Transmitting and receiving are accomplished on a single frequency, instead of the two frequencies used on the Great Lakes.

VHF Service

Vessels within the range of the Chicago Station can obtain service on the VHF Maritime System operating in the 150-162 megacycle band. This service extends approximately to Joliet, Ill. Other VHF stations licensed for vehicular radiotelephone service between Chicago and St. Louis are authorized to give service to vessels on the Illinois River. These stations operate in the 30-50 megacycle band and are located at Ottawa, Peoria, Springfield, Beardstown, Ill.; and St. Louis, Mo. During the month of July, 1954, over 4,000 calls were handled from vessels operating between Chicago and St. Louis. Radiotelephone service is furnished by eleven other authorized vehicular stations on the Mississippi River System.

With the growth of Chicago as a port and the expansion of shipping facilities, it is expected that the traffic on both the Great Lakes and the Inland Waterways will be greatly increased. Undoubtedly the radiotelephone growth will be even more phenomenal.

Midwest Announces Code Library

Midwest Research Institute has announced the development of an extensive code library which will greatly enhance the speed and economy with which engineering computations can be completed in the Institute's Computing Laboratory, and which virtually enables them to offer "mail order" service.

In making the announcement, Dr. Sheldon Levy, manager, Applied Physics Division, noted that while electronic calculations have enormous capabilities, the extent to which these capabilities have been employed has often been curtailed by prohibitive coding costs. A complex calculation may take only minutes to perform but the process of coding prior to the calculation may take days, weeks, or months. In such cases, "one-time," lengthy, computations are often not economically handled by a computer.

Once a code is prepared for a particular engineering problem, however, no further coding is required. Midwest's solution to the high cost of coding was to establish a code library containing the computers instructions for a wide variety of problems in chemical, civil, electrical and mechanical engineering. With this system, according to Dr. Levy, the client need pay only for the actual time spent in calculations on the calculator, plus a nominal per cent which is credited to the development of the code library. And with each new problem completed, new codes are added to the library. Further, the expertness with which a code is prepared also determines the cost of the actual calculations. All the experience and skills of Midwest's engineering analysts and applied mathematicians have been utilized in preparing these library codes. As a result, the calculations are made in the most accurate and rapid manner.

The Midwest Research Institute Computer Laboratory includes two major types of electronic computers: an electronic high-speed digital computer, capable of handling a wide variety of technical and scientific calculations, and the McIlroy Pipeline Network Analyzer, a special-purpose analog computer used to obtain immediate displays of flow conditions in complex pipe networks carrying water, gas, oil and other fluids. The latter, Dr. Levy noted, is one of the few available anywhere in the nation on a consulting basis.

Some examples of projects which have been undertaken at the Computer Laboratory include frame calculations in structural design, heat-flow calculations, material balance in regenerative chemical processes, piping flexibility under conditions of high temperatures and high pressures, electrical network analysis, servo-stability determination, and water distribution studies.

Alaskan Fog Problem Nearer Solution

Successful Alaskan tests on experimental ice fog eliminators recently completed by personnel of the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va., mark a definite advance in the solution of the ice fog problem at air bases in the interior of Alaska.

The man-made fog results from the discharge of exhaust gases from combustion devices into the atmosphere at temperatures from minus 24 to minus 40 degrees Fahrenheit. The low visibility caused by the fog, which at times completely "socks in" the northern bases, seriously hampers aircraft operations.

Field tests were conducted by ERDL on ice fog eliminators incorporated into two 6-hp engines. Without the eliminators, fog appeared as a plume 60 to 70 feet down wind from the exhaust of the two engines. Only slight traces of fog were visible when eliminators were used.

Developed by the Armour Research Foundation under contract with the Laboratories, the eliminators condense the moisture from the engine exhaust gas by cooling, mix it with cold ambient air, and finally reheat the mixture and discharge it to the atmosphere fog free. Equipment based upon this principle can be applied to engine powered ground equipment.

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Heat Transfer Said Almost Universal

There are very few operations in mechanical engineering which can be conducted without heat transfer applications, say engineering experts of The Pennsylvania State University.

They report that everything from the generation of power and air conditioning of buildings to the operation of all types of engines including atomic-powered ones depends upon heat transfer. In fact, they say that new methods of heat transfer are moving along at such a fast pace that current research findings are outdating present text books.

To help correlate these latest research activities in heat transfer, the University is offering a one-week course, June 13-17, on the main campus in State College, Pa., to cover especially those topics for which conventional, long-established methods do not adequately apply.

Personnel engaged in research, design, and manufacture of heat transfer equipment, along with those in the teaching field, will hear such topics as heat transfer charts of nuclear energy reactors, economical design of heat exchanges, developments and problems in boiling, and heat transfer under modern pressure conditions.

Top industrial and educational people in the field will serve as speakers and resource people at the course.

Engineering Societies Personnel Service, Inc.

New York Chicago Detroit San Francisco

These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

OVER THE MANAGER'S DESK

Last month we asked some employers if they would be interested in a charting service showing salary curves. The information for this service would be taken from our files and we would try to show current asking prices and employers offering salaries for different categories of men.

As we are not a charting organization, it means we would have to go to considerable time and expense in order to give you this data, so we are sounding out employers to see if they could use this type of service and if they would be willing to subscribe to it at a nominal annual rate. We do not know our actual cost as of now, but from the figures we have secured so far, it will probably run less than $50 a year.

Up to the time this is being written, we have received some letters from employers, but not enough to really judge the situation.

If you have any ideas or suggestions either for or against such a service, will you be kind enough to drop us a line and let us have your reaction? We want to Serve You, but cannot do so unless we know what you want.

Thank you.
Bonnell H. Allen, Manager
Chicago Office

POSITIONS AVAILABLE

C-2954 PLANT ENGINEER Age: 34-45. 5 plus yrs. exp. in maintenance and operation of power plant, mechanical equipment and kilns. Knowledge of malting operations desirable. Duties: handling complete plant engrg. problems on above equipment. For malt mfger. Salary: $7500 to $10,000. Employer will negotiate fee. Location: Wisconsin.

C-2952 OFFICE & FIELD ENGINEER Degree in engrg. or equival. exp. Age: 25-40. 5 yrs. exp. waterworks and sewer design and construction. Knowledge of waterworks and sewerage construction. Duties: field engineer in charge of inspection of constr. work. For a consulting engr. Sal: $450. Travel: yes. Car required. Location: Illinois.

C-2949 PROCESS ENGINEER—Chemical Chem. eng. or ME Age: 30-35. 3 plus yrs. exp. in processing work in process industries and equipment. Knowl: electronics desirable. Duties: taking physical process and putting it into a system that an analogue computer can handle and then interpreting results for practical use. For an oil refinery. Sal: $500-$750 per mo. Location: Calumet district.

C-2948 FIELD CONSULTING ENGR. ME Age: 30-40. 3 plus yrs. exp. in design or development of variety of products. Sales personality. Duties: working with clients in plant engrg. machine tool and product design fields determining desirable information for copy writing and cataloging nomenclature. Salary: $7200. Employer will negotiate fee. Travel: 15 to 20% No car required. Location: Chicago.

C-2947 SR. DESIGNER Grad. Mech. 5 plus yrs. exp. in small mechanism design. Knowl. of photographic or similar equipment desirable. Duties: Sr. design engr. take project from initial stages and carry through to completion. All work will be on small intricate parts and products. Sal. $8-10,000 depending on exp. Empl. might negotiate fee. Loc: North Shore Suburb.

C-2925 DIRECTOR OF ENGRG. ME or Ag.E. Good administrator with 5 or more yrs. directing product development and engrg. activities. Know: farm machinery or road eqpt. desirable. Duties: directing engineering activities, product development & production tooling for new & improved farm machinery. For a mfger. of farm machinery. Sal: $14-$20,000. Location: Ohio.

C-2901 PAPER ENGINEER — RESEARCH Chem. or Chem. Eng. Duties: research & development in paper quality control or production. For mfger. of building materials. Salary: $600 per month and up. Location: Chicago.

C-2891 SALE OF CHEMICAL EQPT. Chem. Engr. Age: 35-45. 3 plus yrs. exp. in pilot plant operation of vegetable oils. Knowledge of deodorizing and refining edible oils. Duties: sales of equipment to process plants and refiners of vegetable oils. For a mfger. of process equipment. Salary: Up to $12,000/yr. Travel: 30%. Location: Chicago Headquarters.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

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178 MW Asst. Ch. Engr. 30 CE 4 yrs. Charge of structural design, cranes and hoists and related mechanical problems. 1¼ yrs. Charge of constr. repair work. $8000 Midwest.

179 MW Physicist 49 Ph.D.Physics. 21 yrs. research and development of special instruments. 19 yrs. concurrent written above teaching physics and Cosmic Radiation. $9600 Chicago.

180 MW Jr. Engr. 28 Engrg. 3½ yrs. analyzing, repairing and testing AC & DC bridges, radar indicators & radar test eqpt., oscillators and oscilloscopes. $4800 Chicago.

181 MW Staff Engr. 34 ME 2 yrs. plant layout, layout of process eqpt., sewer lines and ventilating systems. 7 yrs. design of material handling and new ordnance equipment. $7000 Chicago.

182 MW Sales Engr. 26 CE 4 yrs. charge of soil testing, necessary for identification, and evaluation of base material. 1 yr. made estimates for road base and surface construction. $6000 Midwest.

184 Consultant 49 EE 7 yrs. planning elec. & distrib. systems, specs., supervising draftsmen, field inspections, cost, & contact contractors. 3 yrs. purchasing pressure vessels; piping; elec. motors and controls $8400 Chicago.

185 MW Ch. Engr. 45 ME 11 yrs. Charge of design and manufacture of production tools, maintenance and established preventive maintenance program. $7000 Midwest.

186 MW Factory Mgr. 34 ME & MBA 8 yrs. resp. for production activities, labor relations, plant maintenance & install production control systems. 1½ yrs. supervised & taught production mgmt. 2½ yrs. supervised investigation and elimination of production bottlenecks. Knowledge of machinery and metal products mfg. $10,000 Chicago.

187 MW Sales Engr. 30 Paper Tech. 5 yrs. determine causes and recommend methods of eliminating waste and organize and run a quality control dept. 2 yrs. supervise production, methods, costs and raw materials. $7500 Chicago.

Human Behavior Blamed for Accidents

Human behavior is responsible for 70 to 80 per cent of industrial accidents, according to a report just published by New York University's Center for Safety Education.

John C. Larson, research associate at the Center and author of the report, says that although much is known about the relationships of safety engineering, diseases, disorders, and physical working conditions to accidents and injuries, "statistics indicate that these factors account for only 20 to 30 per cent of industrial mishaps." He adds that human behavior "apparently accounts for the remainder."

The study, entitled *The Human Element and Industrial Accident Prevention*, shows that such factors as personality characteristics, adjustment to a new job, rejection by co-workers, excessive fatigue, low morale, a tendency to be overly critical of the job, and lack of promotions are high among the various causes of industrial accidents.

"Although a physical working environment contributes to accidents," the NYU safety researcher explains, "the social and psychological climate does so to an even greater degree. Financial considerations are more tangible than prestige, but responsibility, promotion possibilities, and other factors of morale and job satisfaction tend to assume greater importance in the minds of workers."

The NYU Center's report contains summaries and interpretations of more than 200 studies which were screened from 500 abstracts of research projects. Much of the material originally appeared in safety studies in medical, psychiatric, opthalmological, optometric, psychophysical, psychological, and sociological journals, texts, and periodicals.

The safety study contains sections on hiring procedures, orientation, training supervisors and foremen, training workers, morale, job satisfaction, and predicting accidents. It also includes a critique of industrial accident research, an extensive bibliography, four appendices, and a glossary of technical terms.

Prepared by Larson with the assistance of four other researchers at the NYU Center, the study is intended as a guide and reference work for safety engineers, personnel directors, researchers, training directors, industrial psychologists, safety supervisors, college and university instructors, and industrial physicians.

Please, Sir,

Do me the favor to deny me at once.
—Poor Richard's Almanack

Name Solar Energy Committee Members

Members of the technical advisory committee for the World Symposium on Applied Solar Energy, to be held in Phoenix, Nov. 2-5, have been announced by L. W. Douglas, general chairman.

Named to the advisory committee are: Dr. Charles G. Abbot, research associate at the Smithsonian Institution, Washington, D.C.; Dr. Vannevar Bush, president of the Carnegie Institution of Washington; Dr. Godfrey Lowell Cabot, chairman of the board of Godfrey L. Cabot, Inc., Boston, Mass.; Dr. Farrington Daniels, chairman of the Department of Chemistry, University of Wisconsin; Dr. Lawrence J. Heidt, associate professor of physical chemistry and Hoyt C. Hottel, director of Fuel Research Laboratory, both at Massachusetts Institute of Technology.

Also, Dr. Harold Heywood, assistant professor, Imperial College of Science and Technology, University of London, England; Dr. George O. G. Lof, consulting chemical engineer, Denver, Colo.; Dr. Eugene Rabinowitch, research professor of botany, University of Illinois; Dr. Maria Telkes, research associate, College of Engineering, New York University; Dr. Felix Trombe, director of Laboratoire de l'Energie Solaire, Paris, France; Dr. E. J. Workman, president of the New Mexico Institute of Mining and Technology; and Frank Lloyd Wright, architect, Arizona and New York.

The symposium, which will bring scientific and industrial interests to bear on practical applications of solar energy, is being co-sponsored by the Association for Applied Solar Energy and Stanford Research Institute.

Dr. Andrey A. Potter Selected for Award

Dr. Andrey A. Potter, dean emeritus of engineering at Purdue University, has been selected to receive the annual award for meritorious service from the National Society of Professional Engineers.

The award will be presented at the National Society's annual banquet June 4 at the Bellevue-Stratford Hotel in Philadelphia. Dr. Potter will receive an inscribed plaque from Clarence T. Schoch of Allentown, Pa., outgoing NSPE president.

Dr. Potter was selected for the award because of "his inspired teaching and sympathetic encouragement of individual students of engineering, his wise counsel in the field of engineering education, his leadership in raising the status of the profession, and his manifold services to the Nation," according to President Schoch.

A resident of Lafayette, Indiana, Dr. Potter is president of Bituminous Coal Research, Inc. He is the author of several books on power engineering and over 300 published articles on engineering and engineering education.

Holding degrees from M.I.T., Kansas State College, and several other universities, Dr. Potter has served as an engineering consultant to the Government and has been a member of numerous advisory boards and commissions.

He has been associated with Purdue University since 1920 and has been director of the Engineering Experiment Station there. He is widely known in the educational field for his pioneer efforts in personnel work for engineering students, and in humanizing engineering education. His technical work includes research on high pressure steam generating equipment.

Dr. Potter is a member of many technical and professional societies, and received the Engineer in Indiana Award in 1950.

The presentation of the NSPE award June 4 will be the culmination of the National Society's three-day annual meeting in Philadelphia. The recipient of the award in 1954 was Harry A. Winne, electrical engineer, who recently retired as Vice President of the General Electric Company, Schenectady, New York.

Wisely Is New ASCE Secretary

William H. Wisely took office May 2 as executive secretary of the American Society of Civil Engineers. He succeeded Colonel William N. Carey, who held the post ten years and is retiring as executive secretary-emeritus.

A native of Coulterville, Ill., Wisely was graduated from the University of Illinois, from which he holds the degree of B.S. and a professional degree in civil engineering. He has been an assistant engineer in the Illinois State Water Survey, assistant sanitary engineer in the Illinois Department of Public Health and engineer-manager of the Urbana and Champaign Sanitary District. In 1944 Wisely became executive secretary and editor of the Federation of Sewage and Industrial Wastes Associations, leaving the first of this year to become associate secretary of the American Society of Civil Engineers.

He is a special lecturer in civil engineering at the University of Illinois and has been the author and co-author of many technical papers. He received in 1943 the Kenneth Allen Award of the Federation of Sewage Works Associations. From 1952 until recently he was a representative of the State of Illinois in the Ohio River Valley Water Sanitation Commission.

Wisely joined the American Society of Civil Engineers in 1936. He became president of the Society's Central Illinois Section in 1941. He is past-president of the Capital Chapter of the Illinois Society of Professional Engineers and is a member of the National Society of Professional Engineers. He formerly was secretary of the Central States Sewage and Industrial Wastes Association and is a member of the American Water Works Association and of the American Public Health Association.

On Composure

He that can compose himself, is wiser than he that composes books.

—Poor Richard's Almanack

58th Annual ASTM Meet Set

Seven timely symposiums will highlight the 32 technical sessions scheduled for the 58th Annual Meeting of the American Society for Testing Materials to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 27 to July 1, 1955. Symposiums, some of them continuing through three sessions, will be presented on impact testing, judgment of factors in soil testing, high purity water corrosion, atmospheric corrosion of nonferrous metals, speed of testing, and metallic materials for service above 1600 F. Many sessions of individual papers on related subjects will cover soils, nonferrous metals, steel, tests of concrete, fatigue and effect of temperature. There will be a panel session on pyrometric practice in elevated temperature testing sponsored by the Joint ASTM-ASME Committee on Effect of Temperature on the Properties of Metals.

In addition, about 50 of the ASTM's main technical committees and their subgroups have scheduled about 600 meetings for the period of the five days.

The annual Marburg Lecture established by ASTM to honor its first secretary will be presented Wednesday, June 29 at 4:30 p.m., by Dr. Walter J. Hamburger, director, Fabric Research Laboratories, Inc. Boston, Mass. Dr. Hamburger will speak on "A Technology for the Analysis, Design, and Use of Textile Structures as Engineering Materials."

The Gillett Memorial Lecture, sponsored jointly by ASTM and the Battelle Memorial Institue to honor Horace W. Gillett, the first director of Battelle, will be presented by Dr. Fritz V. Lenel, Rensselaer Polytechnic Institute, on Tuesday, June 28 at 5 p.m. Dr. Lenel's lecture title will be "Powder Metallurgy—Now (New Techniques, Improved Properties, Wider Use)".

"What is It?", retiring ASTM President Norman L. Mochel will ask in his presidential address at the ASTM luncheon, Tuesday noon. He will discuss problems relating to the identification of materials. Various awards, including honorary memberships and recognition of 40- and 50-year members will also be a part of the luncheon program.

The ASTM dinner on Wednesday night, followed by a floor show and dancing, will provide relaxation in a week otherwise filled with intensive technical activity. This event is sponsored by the Philadelphia District Council which also will sponsor a very fine program of activities for the ladies throughout the week.

Diffusional Processes To Be Summarized

To summarize recent developments in the theories of diffusional processes and in the application of these theories to engineering practice, a two-week Special Summer Program on "Separation by Diffusional Processes" will be offered at the Massachusetts Institute of Technology from June 20 through July 1 during the 1955 Summer Session.

"The program," says Professor Ernest H. Huntress, Director of the M.I.T. Summer Session, "will present, for the benefit of design, research and development engineers and others having interest in the field of mass transfer, a series of lectures covering recent progress in several divisions of this field."

Dr. Edwin R. Gilliland, Professor of Chemical Engineering, will direct the program, assisted by other members of the M.I.T. staff including: Dr. Raymond F. Baddour, Assistant Professor of Chemical Engineering; Dr. Manson Benedict, Professor of Nuclear Engineering; Dr. Harold S. Mickley, Associate Professor of Chemical Engineering; and Dr. Thomas K. Sherwood, Professor of Chemical Engineering.

Dr. Gilliland explains that "attention will be directed to selected topics in distillation, absorption, extraction, isotope separation, and ion exchange. In addition, lectures covering the general theory of diffusional processes and the measurement and prediction of interphase equilibria are planned."

Full details and application blanks may be obtained from the Summer Session Office, Room 7—103, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

WSE Personals

John Slezak, MWSE, a former undersecretary of the Army, has received an appointment as civilian aide to Army secretary Stevens for the state of Illinois. Slezak was formerly president of the Turner Brass Works, and is closely associated with Kable Brothers Printing Co. at Mount Morris, Ill.

* * *

Lawrence B. Cappa, MWSE, has been appointed division vice-president of the Dixon area of Commonwealth Edison Company's Public Service Division. Previously he had been assistant to the division vice-president of the organization.

* * *

Albert H. Swift, MWSE, formerly an engineer with the American Bridge Division of U. S. Steel, has been named as assistant division engineer in the Chicago office of the division.

* * *

Wayne A. Johnston, MWSE, president of the Illinois Central Railroad, has been named the general chairman of the Illinois State Chamber of Commerce's campaign for membership for this year.

* * *

John S. Hutchins, MWSE, president of the Ramapo Ajax Division of the American Brake Shoe Co. in Chicago, is now in addition president of American Brake Shoe's National Bearing Division. He has been a vice-president of the parent organization since 1946, having originally become a member of the sales department in 1925.

* * *

William V. Kahler, MWSE, president of the Illinois Bell Telephone Co., has been elected to the Board of Trustees of the University of Illinois. The announcement was made by Edward L. Ryerson, chairman of the Board.

Kahler is a past-president of the Western Society of Engineers. He served in World War I before attending the University of Missouri where he was graduated in 1922. Almost immediately he associated himself with the Bell telephone system, taking a position with the Western Electric Co. in New York.

Kahler also served in World War II. He was director of construction with the War Production Board.

Parallel to his new appointment, Kahler is a trustee of the Illinois Institute of Techonology.

* * *

Frank A. Randall, Jr., MWSE, who has been an engineer in the firm of Frank A. Randall and Sons, is leaving for Madrid, Spain to work on a project in that country. His mailing address is: Frank A. Randall, Jr., Structural Engineer.
c/o A.E.S.B.
OICC Budocks Contract
APO 285, New York, N. Y.

Randall had been active on the Illinois Engineering Council where he was concerned chiefly with the registration law.

* * *

Loren E. Howe, MWSE, has been associated for some time with the Herlihy Mid-Continent Co. He holds the position of superintendent.

New Field of Industry Is Analyzed

Commercial engineering—an entirely new profession to American industry—was to be analyzed at the Cost Control conference May 19 and 20 at the Illinois Institute of Technology, Chicago.

The field is so new in the United States that only two companies have commercial engineering departments and only one college is offering courses in the subject, according to the conference director D. Henry Ludmer, associate professor of industrial engineering at Illinois Tech.

Ludmer describes commercial engineering as being primarily the application of engineering skills in the selling of technical equipment, but also includes demand forecasts, commercial research and development, patenting, linear programming of sales management, technical aid to procurement agencies, and the estimating and control of distribution costs.

Reviews of Technical Books

Machine Design

Machine Design, by V. L. Maleev and J. B. Hartman, International Textbook Company, Scranton 9, Pa. Third Edition, 1954. 706 Pages. Price $8.50.

Machine Design, in its third edition will be a book of value to the engineering student as well as the experienced engineer. It has been written in a clear and understanding manner with problems which incorporate the use of the mechanical engineer handbook, as well as manufacturers' catalogues to acquaint the student with the use of these facilities.

There are six main parts which are coordinated in sequence to bring out the proper emphasis in each part. Step by step you are led through design procedure which will enable you to design machine elements, not only from the stress and strain standpoint but from the manufacturing procedure as well.

The authors have included in the text many new and significant developments such as the unified screw thread system; new fastening devices; involute splines; gear design, as well as new materials such as ductile iron and various aluminum and zinc alloys.

Because of the advances made in stress analysis the authors have also included material on statically indeterminate structures, curved beams, shear in beams, dynamic stresses and stress concentration.

E. B. K., W. S.E.

Fluid Mechanics

Fluid Mechanics, by R. C. Binder, Prentice-Hall, Inc., New York. Third edition, 1955. 388 pages.

In the preface of this book the author states: "The aim of this book is to present an introduction to the fundamentals of fluid mechanics." He accomplishes his objective handsomely. The book is meant for a first course in fluid mechanics and contains a graph, illustration or photograph for nearly every fluid flow concept covered in the text. Part I of the test is entitled "Basic Relations" which covers the basic principles of fluid properties, statics, kinematics, dynamics and other topics. The section on dimensional analysis is particularly well written with suitable example of how this useful mathematical tool is applied to specific problems. Part II of the text is entitled "Applications in Fluid Mechanics" and covers the application of the basic principles developed in Part I to various practical situations. This section covers compressible and incompressible flow of fluids in pipes, fluid meters, fluid machines open channel flow, lubrication and a number of the more fundamental principles of subsonic and supersonic flow of compressible fluids. Part II also contains simplified descriptions of various measuring instruments, test cells and other devices associated with modern compressible flow research work. Following each chapter of the book there are questions and problems with complete answers at the end of the text. Each chapter also includes listing of other references and texts to use for more detailed or advanced study. Just as he has in his more advanced books the author makes a well balanced and logical presentation of the subject.

A. J. B., W. S. E.

Turboblowers

Turboblowers, by A. J. Stepanoff, John Wiley & Sons, Inc., New York 16, N. Y. 1955. 377 pages. Price $8.00.

This new book, subtitled "Theory, Design, and Application of Centrifugal and Axial Flow Compressors and Fans," takes into account the developments both in this country and abroad.

The theoretical treatment of the compressor impeller as presented by Stepanoff is based on a single pattern of flow. He extends this reasoning to similar design procedure for centrifugal and axial flow impellers. Departing similarly from past explanations is Stepanoff's stress of the hydrodynamic nature of the head or pressure generation, and his use of available energy function when dealing with the thermodynamic aspects of gas compression.

A lengthy chapter in "Turboblowers" deals exclusively with water-cooled compressors. Since these are little known in this country, although used extensively in Europe, Stepanoff offers a design method with a detailed numerical example and complete energy balance. A detailed account is also given of the high pressure compressor which is more highly advanced abroad.

The author bases the axial flow compressor design method on the actual fluid deflection and observed pressure and capacity coefficient. This he finds preferable to the lift and drag coefficients which are part of the airfoil theory, but he discusses the latter sufficiently to demonstrate its limitations and weaknesses. These and other points combine to unify and clarify the existing concepts of turbomachinery and foster their more effective and economical use.

R. C.

MIT Plans Machine Tool Program

To assist in meeting the intense demand for technical information in the field of automatic control, a two-week Special Summer Program in "Numerical Control of Machine Tools," will be presented by the Massachusetts Institute of Technology from Aug. 22 through Sept. 2, during the 1955 Summer Session.

"Active interest in the automatic control of machine tools by numerical methods continues to grow at an increasing rate," points out Professor Ernest H. Huntress, Director of the 1955 Summer Session. "A number of numerical-control programs are now under way in the aircraft, machine tool, electronic, and other industries.

"This program," continues Professor Huntress, "is planned to provide technical information to industry and government and so to facilitate transfer of numeral control techniques from laboratory development to industrial utilization. It will be directed toward persons who desire to obtain a broad view and understanding of the technical aspects of numerical control as they apply to machine tools."

Professor J. Francis Reintjes, Director of the Servomechanisms Laboratory of the M.I.T. Department of Electrical Engineering, will direct the program, in co-operation with James O. McDonough and other members of the Numerical Control Group in the Laboratory.

"A major advance in the general area of automatic control," explains Professor Reintjes, "has resulted from recent developments in the field of numerical information processing and their application to automatic control of machine tools.

"Since 1949, the Servomechanisms Laboratory of the M.I.T. Department of Electrical Engineering has been engaged in a basic study of the principles of numerical control and their applicability to machine tools, in the construction of experimental machines controlled by numerical data on punched tape, and in analyses and economic evaluation of the procedures and results."

The program, Professor Reintjes points out, is designed especially for engineers contemplating the application and use of such equipment and therefore desiring direct experience in the programming and use of the numerically controlled machine tool.

Lecture topics will include: principles of information—processing as applied to the use of machine tools; numerical-control systems and their machine-tool applications; equipment design for numerical-control systems; design considerations for system reliability; and management, operation, and maintenance of numerically controlled machine tools.

Afternoon sessions will be devoted to programming techniques and will include such topics as mathematics of programming, practical procedures, and machine aids. The group will prepare a program for machining a work piece and actually execute the operation.

The number of registrants is limited, and preference will be given to applicants now engaged in the design or application of automatic machine-tool equipment or anticipating entrance into this field.

Registrants may reserve rooms in the Institute's dormitories during the program. All M.I.T. recreational facilities, including the swimming pool and the popular sailing pavilion on the Charles River Basin, will be available for their use.

Full details and application blanks for this Special Summer Program may be obtained from the Summer Session Office, Room 7 - 103, Massachusetts Institute of Technology, Cambridge 39.

Power Exposition Set For Nov. 14 in Chicago

Announcement has been made that the Chicago Exposition of Power and Mechanical Engineering will be held in the Chicago Coliseum, Nov. 14 to 18, 1955, under the auspices of the American Society of Mechanical Engineers and in conjunction with their 75th anniversary meeting. Space reservations are already being made for the display, which will be located only a short distance from the hotels where the A.S.M.E. meetings will be held. The exposition will be under the management of the International Exposition Co.

Obituaries

The Western Society of Engineers has recently been notified of the following deaths:

Roger R. O'Connor, a member of the Western Society since 1929, died on April 24, 1955. He had been a transmission engineer with the Illinois Bell Telephone Company. Mr. O'Connor had served on a number of committees including Membership, Program, and Publications. He died at Boca Raton, Florida, where he was spending his vacation.

* * *

John A. Dailey, who joined the Society in 1915 and became a Life Member in 1946, died on March 31, 1955. He had been an engineer for the Bureau of Streets, City of Chicago. He had participated in the activities of Hydraulic, Sanitary, and Municipal Section.

* * *

John E. Dutcher, associated with the firm of Schmidt, Garden & Erickson, architects and engineers, died on April 5, 1955. He became a member of the Western Society in 1926. Mr. Dutcher identified himself especially with the Mechanical Engineering activities of the Society.

* * *

Robert A. Cook, a Life Member of the Western Society of Engineers, died on January 26, 1955, the Society has just learned. Joining in 1919, he became a Life Member in 1949. Mr. Cook had been employed by various railroad companies, and by the firm of Greeley and Hansen, engineers.

* * *

Stanley E. Gillespie, a member of The Western Society since 1939, died April 29, 1955. He had been president of the Western Railroad Supply Company. Mr. Gillespie had been especially interested in the activities of the Transportation Section of the Society.

* * *

David C. Wray, a life member of the Society since 1937, and a member since 1901, died on April 28, 1955. He had been one of the few members with over 50 years association with the Society. He was retired at the time of his death.

Index of MIDWEST ENGINEER *Advertisers*

On Training —
Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

After giving considerable thought to your inquiry, I should like to make the following comment as to the educational needs, as I see them, of engineers to equip themselves as supervisors in engineering work and to advance into executive positions:

The general qualifications needed by engineers as supervisors and executives are substantially the same as those required for similar capacities in other lines of endeavor. In other words, the personal and human qualities needed for successful supervision among engineers are substantially the same as required in other professions. As a general proposition we have not found a deficiency in the technical training of engineers. The extent of such training among college graduates is limited only by the native intelligence and ability of the individual. Likewise the personality and cultural development is largely a matter of individuality rather than professional training.

The training necessary for an individual to qualify for a special assignment varies so widely with the individual and the assignment that it is difficult to generalize as to the educational needs of engineers in general. However, I have observed that the greatest weakness in the training of engineers as a profession lies in their inability to clearly and concisely express their thoughts either in writing or in conversation. Obviously, professional knowledge is essential, but if this professional knowledge cannot be disseminated clearly and intelligently, much of its value is lost.

Best wishes.

Sincerely yours,
(Signed)

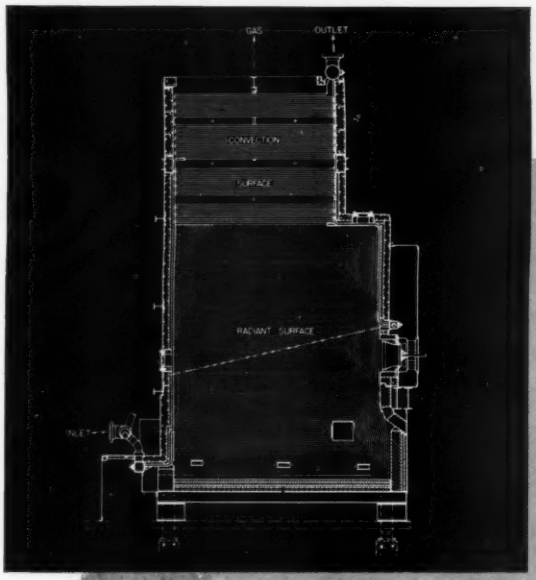
ASTM to Hold 58th Annual Meeting

A wide range of subjects relating to research and testing of engineering materials will be discussed at the 58th Annual Meeting of the American Society for Testing Materials to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-July 1, 1955. A total of 30 sessions are now scheduled beginning on Monday morning and continuing until Friday noon. Six symposiums are scheduled on the following subjects: impact, judgment factors in soils testing, significance of tests of concrete, high purity water corrosion, speed of testing, and metallic materials for service above 1,600 F. In addition, sessions are scheduled at which individual papers will be given on the subjects of soils, nonferrous metals, steel, testing of materials, and fatigue.

Important on each year's program are two lectures, the Edgar Marburg Lecture and the Gillett Memorial Lecture. The Marburg Lecture this year will be given by Dr. Walter J. Hamburger, Director, Fabric Research Laboratory, Inc., Boston, Mass., on the subject of textile fibers. Dr. Fritz V. Lenel, Rensselaer Polytechnic Institute, will give the Gillett Memorial Lecture on metal powders.

Important in the Society's activities are the large number of technical committee meetings which are scheduled. Forty-five committees and their subcommittees will hold a total of about 450 meetings.

On Wednesday evening, June 29, the annual dinner will provide a "break" in a week otherwise devoted to intensive technical activity. Entertainment will include a floor show and dancing.



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Of course, if larger capacities are needed the Combustion line includes boilers of any capacity — for any pressure — for any fuel or method of firing.

Please feel free to call upon us for further detailed information. Catalogs of each of the units illustrated are available upon request.

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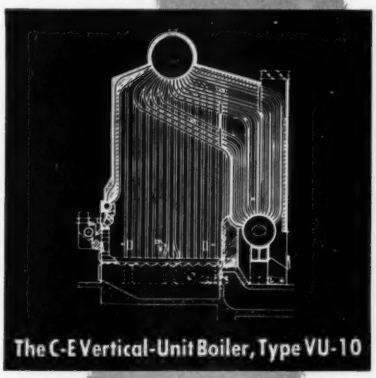
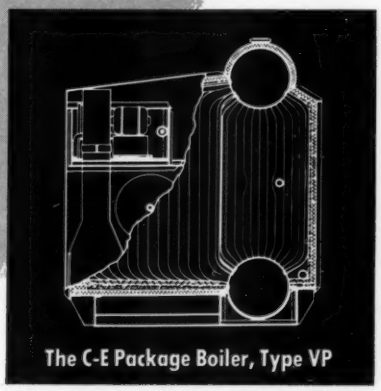


The C-E Vertical-Unit Boiler, Type VU-10

The VU-10 is available in nine sizes from 10,000 to 60,000 pounds of steam per hour . . . for design pressures up to 475 psi . . . up to 200 degrees of superheat available in 20,000-60,000 lb range . . . for solid, liquid, or gaseous fuels. A completely standardized design adaptable to many conditions and particularly well suited to plants having small operating and maintenance forces. It performs efficiently over a wide range of output, and is easy to operate and to maintain.



The C-E Package Boiler, Type VP

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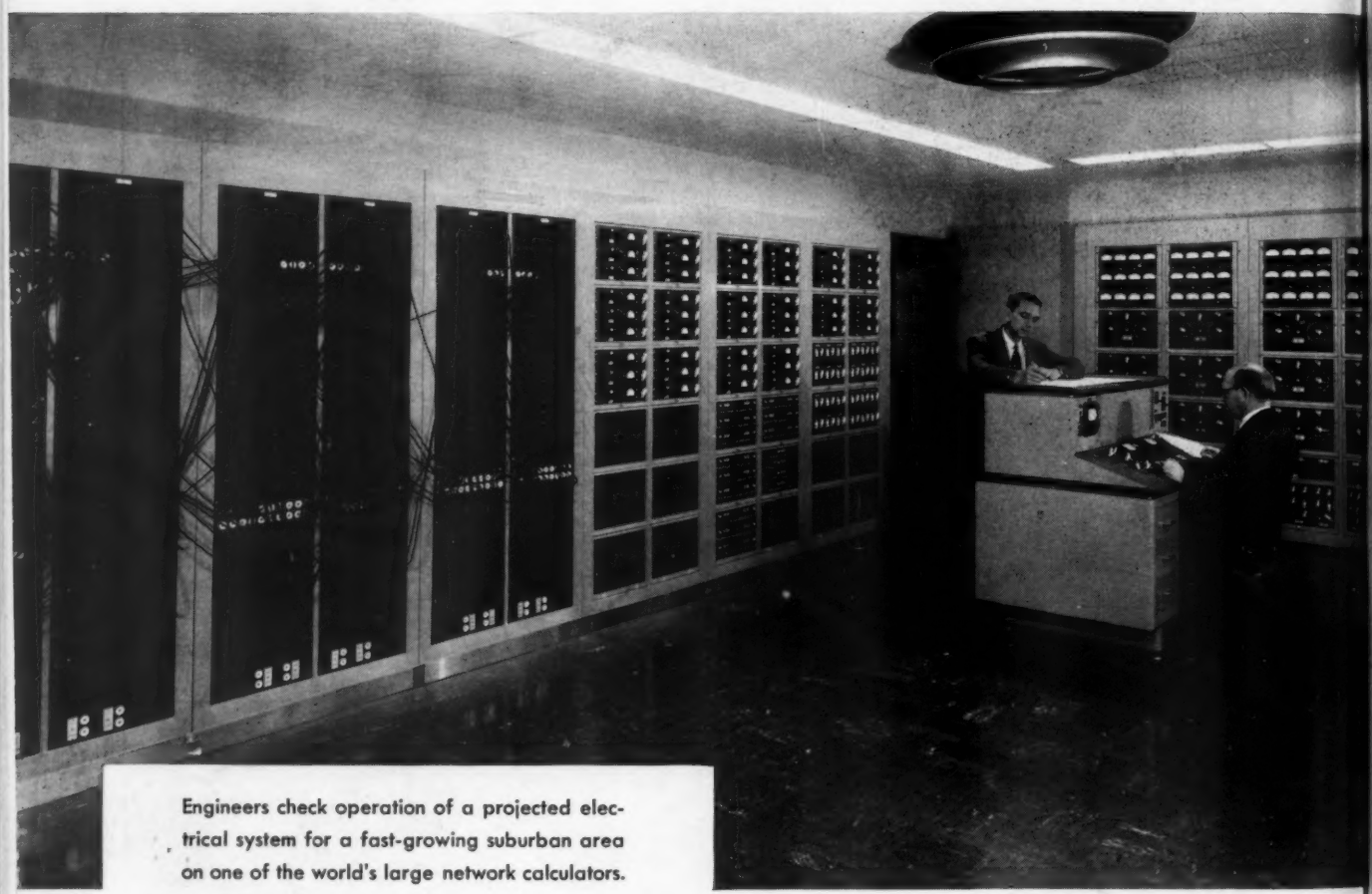
Electric *"answer man"* helps Commonwealth Edison engineers plan 20 years ahead!



Engineers check operation of a projected electrical system for a fast-growing suburban area on one of the world's large network calculators.

Commonwealth Edison's system planning engineers use this big a-c network calculator to help work out our blueprints for tomorrow—as far ahead as 1975!

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